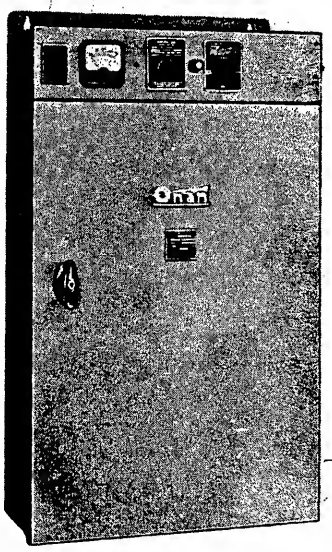
INSTRUCTION MANUAL

AUTOMATIC LINE TRANSFER CONTROLS

Series

LT 100 - LT 200



D. W. ONAN & SONS INC. • MINNEAPOLIS 14, MINN.

913-19▲▲ *Price $1.00* A E Printed in U.S.A.

IMPORTANT!

IT IS RECOMMENDED THAT THIS LINE TRANSFER CONTROL BE INSTALLED BY AN EXPERIENCED ELECTRICIAN.

THE POINT AT WHICH THE LINE TRANSFER CONTROL IS CUT INTO THE MAIN LINE WILL VARY ACCORDING TO THE TYPE OF ENTRANCE SWITCH IN THE MAIN LINE.

WHERE AN ENTRANCE SWITCH OF THE TYPE USED IN MOST INDUSTRIAL APPLICATIONS IS USED, THE LINE TRANSFER CONTROL CAN BE CUT INTO THE MAIN LINE BETWEEN THE MAIN FUSES AND THE BRANCH CIRCUIT FUSES. THE MAIN SWITCH CAN THEN BE PULLED UNTIL ALL CONNECTIONS ARE COMPLETED. LOAD WIRES FROM THE LINE TRANSFER CONTROL CAN THEN BE CUT INTO THE LOAD CIRCUIT BEFORE THE BRANCH CIRCUIT FUSES.

IF THE STANDBY PLANT IS NOT EQUIPPED WITH A CIRCUIT BREAKER, A FUSED SWITCH OR CIRCUIT BREAKER HAVING THE SAME CAPACITY AND ELECTRICAL CHARACTERISTICS AS THE STANDBY PLANT SHOULD ALSO BE INSTALLED BETWEEN THE STANDBY PLANT AND THE LINE TRANSFER CONTROL.

IF STANDBY SERVICE IS LIMITED TO A SPECIFIC LOAD, CUT INTO THE BRANCH CIRCUIT SERVICING THAT LOAD AFTER THE BRANCH CIRCUIT FUSE. IF THE STANDBY PLANT IS NOT EQUIPPED WITH A CIRCUIT BREAKER, INSTALL A FUSED SWITCH OR CIRCUIT BREAKER OF THE SAME CAPACITY AND ELECTRICAL CHARACTERISTICS AS THE LINE TRANSFER CONTROL BETWEEN THE PLANT AND THE CONTROL.

GENERAL INFORMATION

THE PURPOSE OF THIS BOOK. This instruction book is furnished so that the operator may learn of the characteristics of the control. A thorough study of the book will help the operator to keep the control in good operating condition so that it will give efficient service. An understanding of the control will also assist the operator to determine the cause of trouble if it occurs.

KEEP THIS BOOK HANDY. Such simple mistakes as the neglect of routine servicing may result in failure of the control at a time when it is urgently needed. It is suggested that this book be kept near the control so that it may be referred to when necessary.

SERVICE. If trouble occurs and the operator is unable to determine the cause after a thorough study of this book, or if he is unable to determine what repair parts are required needed information will be furnished upon request. When asking for information, be sure to state the Model, Spec., and Serial numbers of the control. This information is absolutely necessary and may be obtained from the nameplate on the control.

MANUFACTURER'S WARRANTY

The Manufacturer warrants each product of its manufacture to be free from defects in material and factory workmanship if properly installed, serviced and operated under normal conditions according to the Manufacturer's instructions.

Manufacturer's obligation under this warranty is limited to correcting without charge at its factory any part or parts thereof which shall be returned to its factory or one of its Authorized Service Stations, transportation charges prepaid, within ninety (90) days after being put into service by the original user, and which upon examination shall disclose to the Manufacturer's satisfaction to have been originally defective. Correction of such defects by repair to, or supplying of replacements for defective parts, shall constitute fulfillment of all obligations to original user.

This warranty shall not apply to any of the Manufacturer's products which must be replaced because of normal wear, which have been subject to misuse, negligence or accident or which shall have been repaired or altered outside of the Manufacturer's factory unless authorized by the Manufacturer.

Manufacturer shall not be liable for loss, damage or expense directly or indirectly from the use of its product or from any other cause. The Manufacturer makes no warranty whatsoever with respect to component parts which are warranted separately by their respective manufacturers.

The above warranty supersedes and is in lieu of all other warranties, expressed or implied, and no person, agent or dealer is authorized to give any warranties on behalf of the Manufacturer nor to assume for the Manufacturer any other liability in connection with any of its products unless made in writing and signed by an official of the Manufacturer.

IMPORTANT

RETURN WARRANTY CARD ATTACHED TO CONTROL

TABLE OF CONTENTS

GENERAL. - The ONAN line transfer switch is designed for use with a remote start type electric generating plant installed for standby service. In such service, the standby electric plant is operated when the regular source of electrical power fails, or if for any other reason it is desired to have the standby plant carry the electrical load. The regular power source may be either a regular commercial power line, or another generating plant.

The normal source of power, the standby plant, and the line transfer switch; all must have the same electrical characteristics: voltage, frequency, phase, and number of wires.

The maximum electrical load that the line transfer switch will safely carry is listed on the nameplate. Be sure that the maximum current requirements of the electrical circuit never exceeds the nameplate rating of the transfer switch, even if a much smaller capacity standby plant is used.

In operation, the line transfer switch connects the electrical load lines to the normal source of power. Upon failure or excessively low voltage of the normal power source, the transfer switch disconnects the normal power source, starts the standby plant, and connects the standby plant to the electrical load lines. When the normal source of power is again restored the transfer switch disconnects the standby plant, stops it and connects the load to the normal power source.

Standard models of line transfer switches are for use on either 50 or 60 cycle current. Standard models are identified as SPEC. 1. A special model will be identified by a different SPEC. number and its electrical charteristics will be noted on the nameplate.

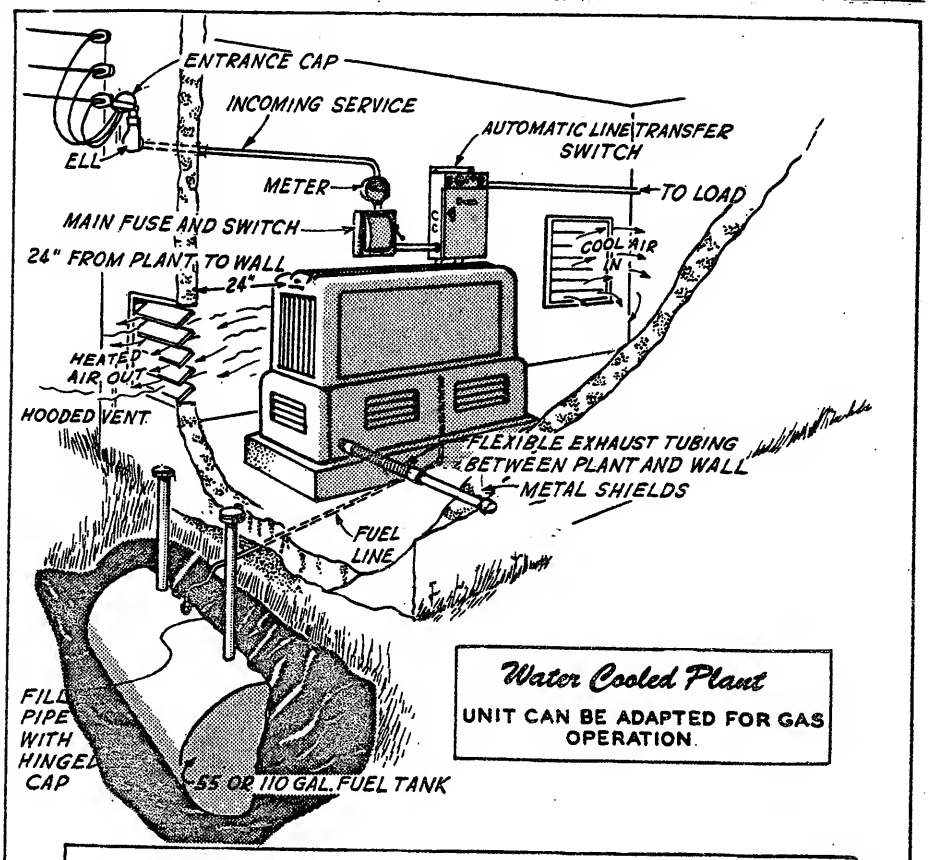
STANDARD ACCESSORIES

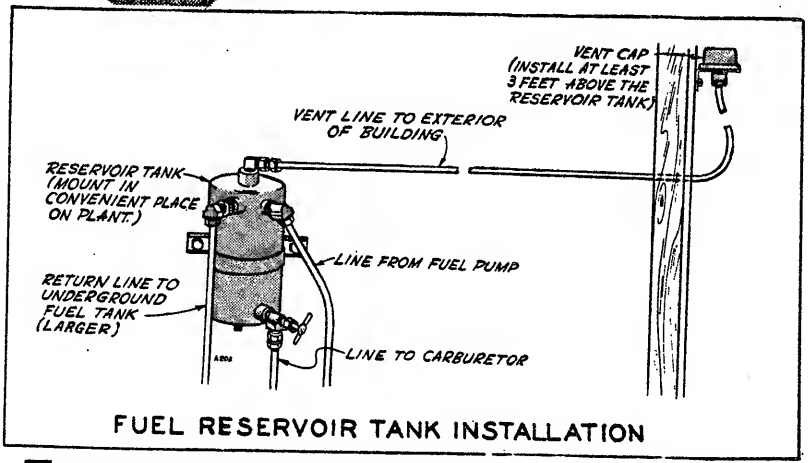
FUSE. - The fuse holder contains a 1 ampere cartridge type fuse connected in the primary circuit of the battery charging transformer. Do not substitute a fuse of a different ampere rating.

CHARGE RATE RHEOSTAT. - The charge rate rheostat provides for adjusting the built-in "Trickle" battery charging rate. The charge rate should be adjusted to give the lowest charge rate that will keep the starting batteries in a fully charged condition. Turn the rheostat knob to the left to decrease the charge rate, or to the right to increase the charge rate, as indicated in the following paragraph.

MILLIAMMETER. - The milliammeter reading indicates the battery charge rate, as adjusted by the charge rate rheostat. When first putting the transfer switch into operation, turn the charge rate rheostat to its left hand limit, for the lowest charge rate. This low charge rate will vary, depending upon the voltage of the normal source of power, from possibly 40 to 70 milliamperes. Check the charge condition of the batteries weekly, and if their charge condition drops even slightly, increase the charge rate in steps of 20 milliamperes until the charge condition stabilizes. NOTE: The built in charge circuit of the transfer switch is strictly a "trickle" charging system and is not intended to provide for "boosting" a low discharged battery.

CRANKING LIMITER. - The cranking limiter prevents prolonged cranking of the standby plant if it fails to start. The cranking limiter allows sufficient cranking time for a normal start, varying from 45 seconds to 2 minutes depending upon the battery condition. Should the cranking limiter operate to break the starting circuit, the red re-set button will protrude so that its sides will be visible. Investigate the cause of the failure to start, and correct the trouble. Wait at least 1 minute before pushing the button in to re-set the cranking limiter.





FUEL RESERVOIR TANK INSTALLATION

Typical Onan Standby Installation

THIS INSTALLATION IS A TYPICAL ONE.
BEFORE INSTALLING CHECK REGULATIONS.

FIG. 1.

INSTALLATION

GENERAL. - The successful installation of your automatic line transfer control requires that certain precautions be taken to protect your equipment against possible damage from overloading, the use of too small line wires, improper connections or connecting single phase loads to a 3 phase or 3 wire system. Plan your installation carefully before purchasing material. Obtain the services of a competent electrician or consult your dealer or local electrical supply house. Read all instructions carefully before making the installation.

CHECK THE STANDBY PLANT INSTALLATION. - Check to see that your standby plant has been properly installed according to the manufacturers instructions. See that the plant starts, operates and stops satisfactorily when started and stopped by means of the START and STOP buttons on the plant control panel.

NOTE: Starting battery of standby plant must be negative grounded or rectifier of automatic line transfer control will burn out.

MOUNTING THE CONTROL BOX. - The control box supplied with control is designed for indoor installation and should be protected from excessive heat, moisture, dust and dirt.

Mount the line transfer control box on a vertical wall, switchboard, or other substantial and permanent support where it will not be subjected to excessive vibration. Secure the box with bolts or screws. The switch is designed for mounting on a wall. Keyhole mounting holes in the top flange permit hanging the switch box on two bolts previously inserted in the wall. The box is secured in place with two lower bolts inserted after the box is in place. See the mounting illustration, Fig. 2.

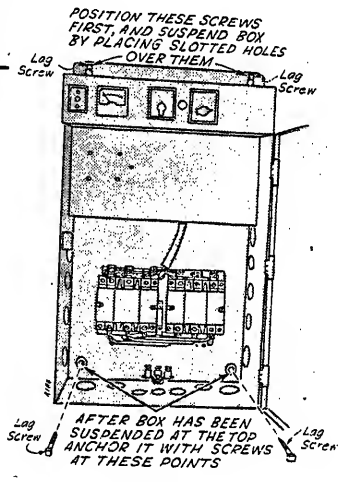


FIG. 2.

The box conforms to N. E. M. A. Type I enclosure specifications. Do not mount out of doors.

WIRING. - The normal source of power should be provided with a suitable switch and fuses or with a circuit breaker before entering the automatic line transfer control box. Load circuits should be properly fused. Wiring outside the line transfer control should be run in conduit. If rigid conduit is used between the automatic line transfer control box and the standby plant, install a short length (2 ft. minimum)

of flexible conduit between the rigid conduit and the standby plant to absorb vibration.

Knockout sections are located at various points in the line transfer box. Use the "knockouts" most conveniently located for the connection being made. Run the generator output wires through a separate conduit from that used for the remote control circuit wires. Pull all wires for any one conduit through the conduit at the same time. Be sure all connections are made securely, following the procedure outlined in the following paragraphs.

Control circuit wires from the standby plant to the line transfer control should be size 16 wire or larger up to 100 feet. Use larger wire for longer distances.

Wires should be color coded if possible for identification purposes. The installation will be described using the following color code.

CONTROL CIRCUIT COLOR CODE			ALL MAIN A.C. CIRCUITS
B	+	GREEN	HOT WIRES - BLACK
1	-	WHITE	
2	-	YELLOW	
3	-	RED	GROUND WIRES-WHITE

WIRE CONNECTIONS AT THE LINE TRANSFER CONTROL

CAUTION: Keep the main power switch or circuit breaker open until all connections are made. Also open the line transfer control box and turn the selector switch indicator to the STOP position.

CONTROL CIRCUIT CONNECTIONS. - Control circuit connections are the same for all automatic line transfer controls.

Located on the standby plant control box is a four place terminal block marked REMOTE CONTROL B+, 1, 2, and 3. The control circuit terminals in the line transfer control box are also marked B+, 1, 2, and 3. Pull all the control circuit wires through the conduit at the same time. Refer to the appropriate Typical Installation Diagrams as shown in Figures 3, 4, 5, and 6. Then make connections as follows:

1. Connect the "RED" wire from the No. 3 REMOTE CONTROL terminal on the standby plant to the No. 3 terminal on the line transfer control panel.

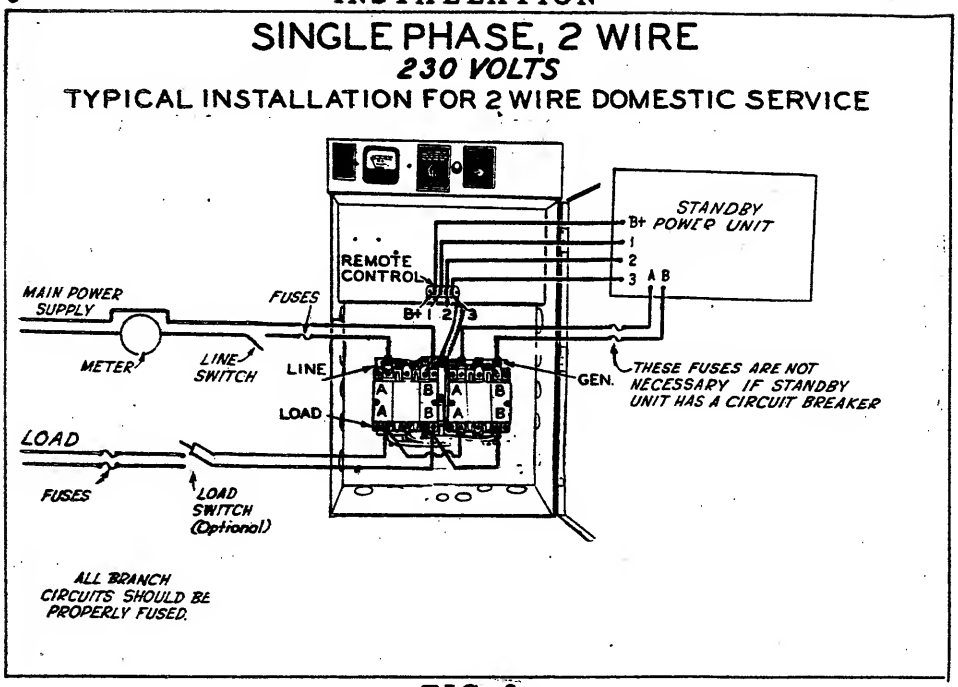

SINGLE PHASE, 2 WIRE
230 VOLTS
TYPICAL INSTALLATION FOR 2 WIRE DOMESTIC SERVICE
STANDBY POWER UNIT
B+
1
2
3
A B
REMOTE CONTROL
B+ 1 2 3
MAIN POWER SUPPLY
FUSES
METER
LINE SWITCH
LINE
LOAD
GEN.
THESE FUSES ARE NOT NECESSARY IF STANDBY UNIT HAS A CIRCUIT BREAKER
LOAD
FUSES
LOAD SWITCH (Optional)
ALL BRANCH CIRCUITS SHOULD BE PROPERLY FUSED.

FIG. 3.

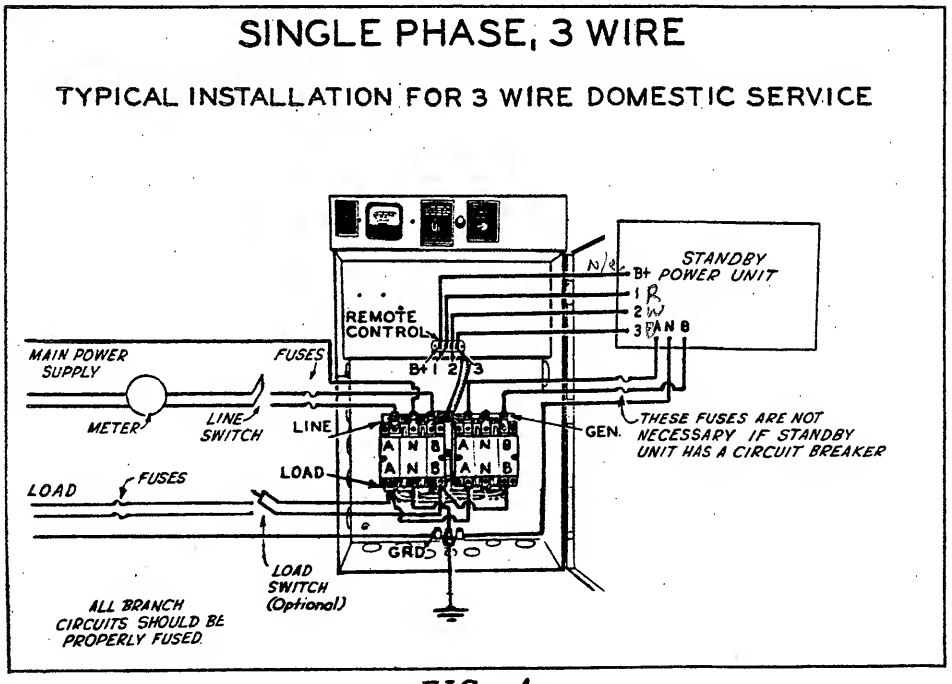

SINGLE PHASE, 3 WIRE
TYPICAL INSTALLATION FOR 3 WIRE DOMESTIC SERVICE
STANDBY POWER UNIT
B+
1
2
3
A N B
REMOTE CONTROL
B+ 1 2 3
MAIN POWER SUPPLY
FUSES
METER
LINE SWITCH
LINE
LOAD
GEN.
THESE FUSES ARE NOT NECESSARY IF STANDBY UNIT HAS A CIRCUIT BREAKER
LOAD
FUSES
GRD
LOAD SWITCH (Optional)
ALL BRANCH CIRCUITS SHOULD BE PROPERLY FUSED.

FIG. 4.

THREE PHASE, 3 WIRE

TYPICAL INSTALLATION FOR INDUSTRIAL USE WHERE 3 PHASE MOTORS ARE OPERATED

CAUTION - WHEN USING A 3 PHASE, 4 WIRE, DELTA CONNECTED GENERATOR WITH A 3 PHASE, 3 WIRE, INCOMING SERVICE: - DO NOT GROUND NEUTRAL WIRE OF GENERATOR -

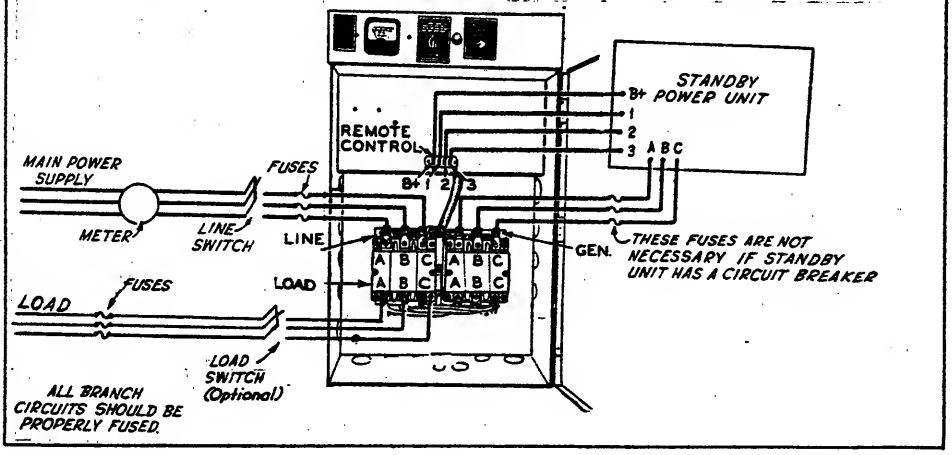


FIG. 5.

THREE PHASE, 4 WIRE

TYPICAL INSTALLATION FOR INDUSTRIAL USE WHERE 3 PHASE-DUAL VOLTAGE IS REQUIRED

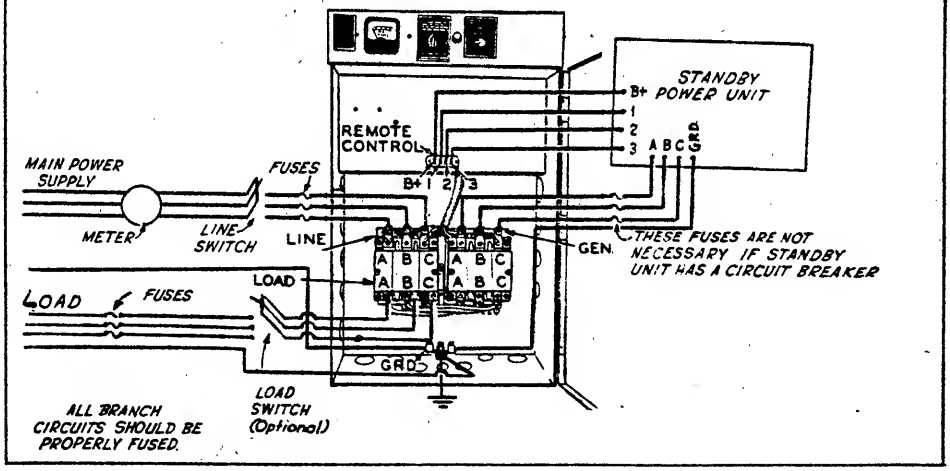


FIG. 6.

2. Connect the "YELLOW" wire from the No. 2 REMOTE CONTROL terminal on the standby plant to the No. 2 terminal on the transfer control panel.

3. Connect the "WHITE" wire from the No. 1 REMOTE CONTROL terminal on the standby plant to the No. 1 terminal on the line transfer control panel.

4. Connect the "GREEN" wire from the B+REMOTE CONTROL Terminal on the standby plant to the B+terminal on the line transfer control panel.

LINE - LOAD - GENERATOR CONNECTIONS

The ampere-rating of the line transfer control must be equal to, or greater than the ampere-rating of the incoming power service, unless the standby equipment is to protect only a portion of the total load. The ampere-rating of the line transfer control would then have to be equal to, or greater than the maximum amperage normally flowing in that circuit.

The ampere-rating of the control must also be equal to, or greater than that of the maximum output of the standby generator. In almost every case, matching the control to the ampere-rating of the incoming service will satisfy the requirement. However, the ampere-rating of the incoming service will in most cases require a control of larger ampere-rating than would be the case if only the capacity of the standby plant were considered.

Be careful if the standby plant service is a 3 wire system. The load selected for operation during emergency service might happen to be served by one of the two HOT wires of the line. In that case half of a 115/230 volt generator would be 100% overloaded, the other half idle. This can be remedied by minor rewiring at the fuse box of the installation so that the selected load to be operated during emergency is served roughly half and half by each of the two HOT Wires.

MODEL LT100-21 & LT200-21:

Line Transfer Switch to Standby Plant

NOTE: See that selector switch is at the (STOP) position.

1. Connect the BLACK wire from the AC OUTPUT terminal of the standby plant marked "A" to the terminal on the line transfer switch marked GEN. "A."

2. Connect the WHITE wire from the AC OUTPUT terminal of the standby plant marked "GRD" to the nutral terminal of the line transfer control marked "GRD".

Line Transfer Switch to Load.

Cut Load wires in before branch circuit fuses if an industrial type entrance switch is used.

1. Connect the BLACK wire from the load to the terminal on the line transfer control marked LOAD "A".
2. Connect the WHITE (ground) wire from the load to the nutral terminal on the line transfer control marked "GRD".

Line Transfer Switch to Normal Source of Power.

In industrial installations it is usually possible to cut into the circuit between the main fuses and the branch circuit fuses. Pull the main switch and leave it open until the installation is completed.

1. Connect the BLACK wire from the normal source of power to the terminal on the line transfer switch marked LINE "A".
2. Connect the WHITE wire from the normal source of power to the nutral terminal on the line transfer switch marked "GRD".

MODEL LT100-22 & LT200-22:

Line Transfer Switch to Standby Plant.

NOTE: See that selector switch is at (STOP) position.

1. Connect the BLACK wire from the AC OUTPUT terminal of the standby plant marked "A" to the terminal on the line transfer switch marked GEN. "A".
2. Connect the WHITE wire from the AC OUTPUT terminal of the standby plant marked "GRD" to the terminal on the line transfer switch marked "GEN. "B".

Line Transfer Switch to Load.

Cut Load wires in before branch circuit fuses if an industrial type entrance switch is used.

1. Connect the BLACK wire from the load to the terminals on the line transfer control marked LCAD "A".
2. Connect the WHITE wirefrom the load to the terminal on the line transfer control marked LCAD "B". NOTE: If one side of the load is grounded, be sure the grounded wire is connected at line transfer switch LCAD terminal "B" or a short circuit will result. In some cases 230 volt service is not grounded. If the 230 volt service being connected to is an ungrounded system, both load wires are BLACK and

in that case either BLACK wire can be connected to line transfer control terminal labeled "B".

Line Transfer Switch to Normal Source of Power

In industrial installations it is usually possible to cut into the circuit between the main fuses and the branch circuit fuses. Pull the main switch and leave it open until the installation is completed.

1. Connect the BLACK wire from the normal source of power to the terminal on the line transfer switch marked LINE "A".
2. Connect the WHITE wire from the normal source of power to the terminal on the line transfer switch marked LINE "B".

MODEL LT100-23 & LT200-23:

Line Transfer Switch to Standby Plant.

1. See that selector switch is at the (STOP) position.
2. Connect one BLACK wire from the AC OUTPUT terminal on the standby plant marked "A" to the terminal on the line transfer control marked GEN. "A".
3. Connect the other BLACK wire from the AC Output Terminal on the standby plant marked "B" to the terminal on the line transfer control marked GEN. "B".
4. Connect the WHITE wire from the AC OUTPUT terminal on the standby plant marked "GRD" to one of the neutral block terminals of the line transfer control.

Line Transfer Switch to Load

Cut LOAD wires in before branch circuit fuses if an industrial type entrance switch is used.

1. Connect one "BLACK" wire from the load to the line transfer switch terminal marked LOAD "A".
2. Connect the other BLACK wire from the load to the line transfer switch terminal marked LOAD "B".
3. Connect the WHITE wire from the load to one of the neutral block terminals of the line transfer control.

Line Transfer Switch to Normal Source of Power

In industrial installations it is usually possible to cut into the circuit between the main fuses and the branch fuses. Pull the main switch and leave it open until the installation is completed.

1. Connect one BLACK wire from the normal source of power to the line transfer switch terminal marked LINE "A".
2. Connect the second BLACK wire from the normal source of power to the line transfer switch terminal marked LINE "B".
3. Connect the WHITE wire from the normal source of power to one of the neutral terminals of the line transfer control.

MODEL LT100-24, LT200-24, LT100-25D, LT200-25D, LT100-27 and LT200-27:

Line Transfer Switch to Standby Plant

1. See that the selector switch is at (STOP) position.
2. Connect one BLACK wire from the AC OUTPUT terminal on the standby plant marked "A" to the line transfer terminal marked GEN. "A".
3. Connect the second BLACK wire from the AC OUTPUT terminal on the standby plant marked "B" to the line transfer switch terminal marked GEN. "B".
4. Connect the third BLACK wire from the AC OUTPUT terminal on the standby plant marked "C" to the line transfer switch terminal MARKED GEN. "C".
5. Connect the WHITE wire from the AC OUTPUT terminal on the standby plant marked GRD. to the neutral terminal on the line transfer control ground bar.

Line Transfer Switch to Load

Cut Load wires in before branch circuit fuses if an industrial type switch is used.

1. Connect one BLACK wire from the load to the line transfer switch terminal marked LOAD "A".
2. Connect the second BLACK wire from the load to the line transfer switch terminal marked LOAD "B".
3. Connect the third BLACK wire from the load to the line transfer switch terminal marked LOAD "C".

4. Connect the WHITE wire from the load to one of the neutral block terminals of the line transfer control.

Line Transfer Switch to Normal Source of Power

In industrial installations it is usually possible to cut into the circuit between the main fuses and the branch circuit fuses. Pull the main switch and leave it open until the installation is completed.

1. Connect the BLACK wire from the normal source of power to the line transfer switch terminal marked LINE "A".
2. Connect the second BLACK wire from the normal source of power to the line transfer switch terminal marked LINE "B".
3. Connect the third BLACK wire from the normal source of power to the line transfer terminal marked LINE "C".
4. Connect the WHITE neutral wire from the normal source of power to one of the neutral terminals of the line transfer control.

CAUTION: See Checking Phase Relations Before Applying Current

MODEL LT100-25, LT200-25, LT100-26, and LT200-26:

Line Transfer Switch to Standby Plant

1. See that selector switch is at (STOP) position.
2. Connect one BLACK wire from the AC OUTPUT terminal on the standby plant marked "A" to the line transfer switch terminal marked GEN. A".
3. Connect the second BLACK wire from the AC OUTPUT terminals on the standby plant marked "B" to the line transfer switch terminal marked GEN. "B".
4. Connect the third BLACK wire from the AC OUTPUT terminal on the standby plant marked "C" to the line transfer terminal switch marked GEN. "C".

Line Transfer Switch to Load

Cut Load wires in before branch circuit fuses if an industrial type entrance switch is used.

1. Connect one BLACK wire from the load to the line transfer switch terminal marked LOAD "A".

2. Connect the second BLACK wire from the load to the line transfer switch terminal marked LOAD "B".

3. Connect the third BLACK wire from the load to the line transfer switch terminal marked LOAD "C".

Line Transfer Switch to Normal Source of Power

In industrial installations it is usually possible to cut into the circuit between the main fuses and the branch circuit fuses. Pull the main switch and leave it open until the installation is completed.

1. Connect one BLACK wire from the normal source of power to the line transfer switch terminal marked LINE "A".

2. Connect the second BLACK wire from the normal source of power to the line transfer switch terminal marked LINE "B".

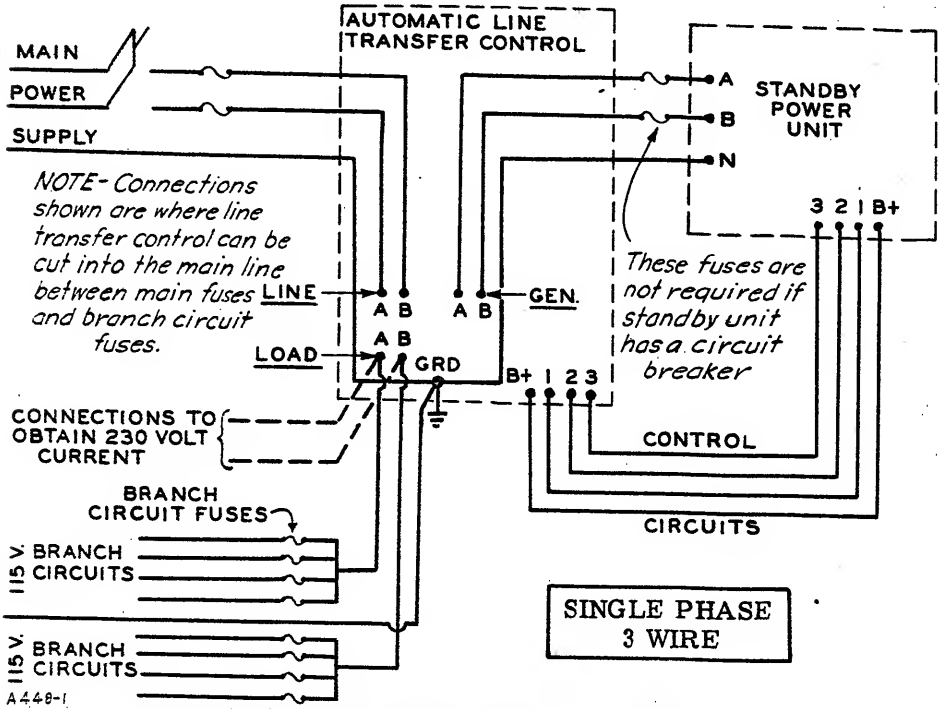
3. Connect the third BLACK wire from the normal source of power to the line transfer switch terminal marked LINE "C".

CAUTION: See Checking Phase Relations Before Applying Current.

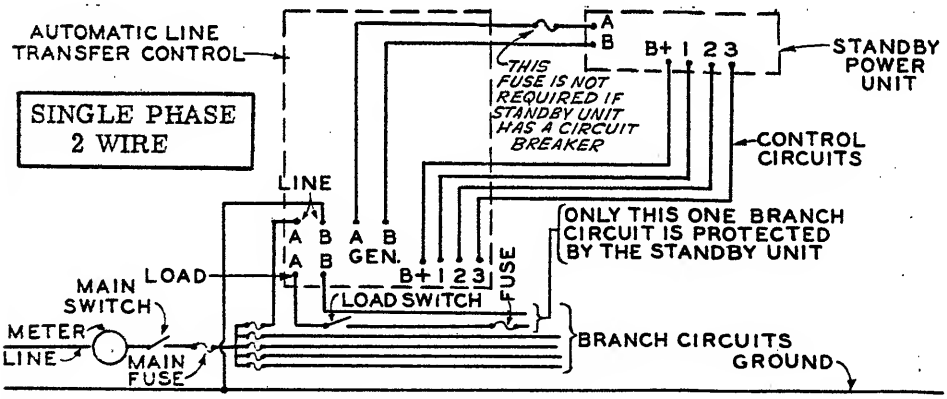
CHECKING PHASE RELATIONS

When a 3-phase automatic line transfer control has been connected the correctness of phase relationship between the main power source, the load and the standby power source should be checked if the load includes a 3-phase motor or if for any other reason the sequence of phases is important. If there is no 3-phase motor on the load circuit, one should temporarily connected for use in checking. Close the switch or circuit breaker which has been installed in the main power line, thus connecting the automatic line transfer switch to the main source of power. If that source is at normal voltage, the line transfer switch will connect the load to the main power source automatically. Then close the motor switch and note whether the motor operates in the proper direction. If it does not, open the main switch and transpose any two of the three main phase leads at the LINE terminal posts. This will correct the phase relationship between the main power source and the load.

Leave the main line switch open and turn the selector switch to AUTO position. This will cause the standby plant to start and to take over the motor load. Note whether the motor operates in the proper direction. If it does, the phase relationship between all three circuits is correct. If it does not, stop the plant by turning the selector switch to the STOP position and transpose any two of the three main three phase leads at the GENERATOR or GEN. terminal posts to effect the necessary correction.



TYPICAL INSTALLATION FOR INDUSTRIAL USE



TYPICAL INSTALLATION
FOR STANDBY SERVICE ON BRANCH CIRCUIT ONLY
FIG. 14.

It is important that the checking of phase relationship be done in the order described if the preceding instructions are to apply.

3 PHASE SERVICE WITH SINGLE PHASE STANDBY

Any two wires of a 3 phase line will deliver only single phase power. If in any building with 3 phase service any motor (or other device) has only two wires connected to it, it is a single phase device. All light bulbs in a building collectively may be served from all 3 phases but any one bulb is operated by single phase power.

If a standby plant is to take care of only certain pre-selected items in the installation, those items may be single phase devices. But be careful about several devices each of which is single phase. Two such devices may be served each by two different phases of a three phase line. DON'T GUESS. If you don't thoroughly understand the implication and complications of single and three phase, 2 and 3 wire installations, the danger of overloading one winding of the several sections of a 3 wire, three phase generator is great. Before proceeding, have the problem analyzed by a competent electrician who understands the problems of balance and unbalance in electrical circuits. Should problems arise that cannot be handled locally, write the factory in complete detail giving the following facts.

1. Is service to building single or three phase? What is the voltage?

2. Is service to building 2, 3, or 4 wire?

3. Is standby plant to carry the entire load in emergency or only specific items? If specific items only, are they single or three phase loads? Give wattage or amperage and volts of each specific item.

4. State the type of automatic line transfer control you have if any.

5. Give all other details possible.

OTHER METHODS OF CONNECTING LINE TRANSFER CONTROLS

1. Where the standby equipment is to service a specific load, only a single branch circuit is involved. When there is no emergency, the line transfer contactor is then carrying only the current flowing in that circuit and its amperage rating need be no greater than the fuse protecting that circuit. For the sake of simplicity only one wire is shown. Connections to the line transfer control are the same as described for standby service of the entire load, the only difference being in the point at which the standby service cuts into the normal power source.

After all line, load, generator and control circuit connections have been made, check to see that the standby plant operates properly before setting the line transfer selector switch for automatic operation. Throw the main line switch in to connect the load to the normal source of power. Then turn the selector switch on the automatic line transfer control panel to "CHECK" position. The standby plant should start at once but it will not take over the load as long as the power is supplied by the normal source. Pull the main line switch to see that the load transfers to standby service. Then again throw the main line switch in and turn the selector switch to "AUTO" position and the installation is completed and ready for standby service. With the selector switch at "AUTO" position, the plant will start automatically when the normal power source fails and will stop automatically when power is again available from the normal source.

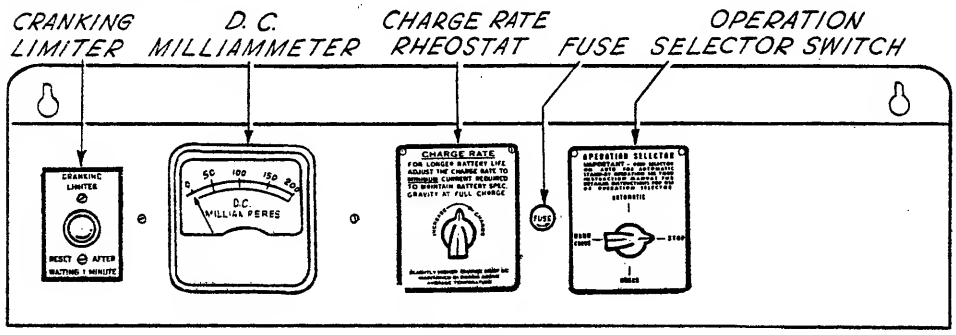


FIG. 15.

With the automatic line transfer control properly connected and the normal power source supplying current to the load, the standby plant will start upon failure of the normal power source regardless of whether or not there is any load connected to the load circuit.

FUNCTIONING OF THE SELECTOR SWITCH

HAND CRANK POSITION

With the selector switch at the Hand Crank position the standby plant will not start automatically upon failure of the normal power source. The standby plant may be started by means of the start button on the plant control panel or it may be started by hand cranking. NOTE: The manual-remote switch on the standby plant must also be thrown to HAND CRANK position when starting the standby plant by hand cranking. This switch must be returned to ELEC. START position as soon as the plant starts or the battery may become discharged if the engine stops with ignition points closed.

The standby plant will operate normally but will not supply power to the load unless the main power source is not supplying current or because the main line switch or fuse is open. The standby plant may be stopped by turning the selector switch to the "STOP" position.

STOP POSITION

When the standby plant is running and it is desired to stop it, turn the selector switch to the "STOP" position. The standby plant cannot be started in any normal manner while the selector switch is at STOP position.

The selector switch always should be turned to "STOP" position when servicing the standby plant, making adjustments or repairs, or whenever it is desired to prevent the standby plant from starting upon failure of the normal power source.

AUTO POSITION

The selector switch must be turned to the "AUTO" position whenever it is desired to have the line transfer control operate automatically. With the selector switch at AUTO position and the automatic line transfer control properly connected, the standby plant will start upon failure of the normal power source whether there is any load on the load circuit or not. When the voltage of the normal power source falls quite low or fails entirely, the main actuating coil of the contactor will become de-energized or nearly so. When this occurs, spring action will open the line-load contacts of the contactor. This action disconnects the load from the normal power source. The line transfer control can be prevented from operating automatically by turning the selector switch to the "STOP" position.

The contacts of the start-stop relay are connected in the standby plant control circuit. The outer set of contacts are in the start circuit, the inner set are in the stop circuit. Closing of the outer contacts closes the starting circuit of the standby plant and the plant is started automatically.

After the standby plant starts, its output voltage builds up and the coil of the start disconnect relay connected across the generator output becomes energized and opens its contacts. These contacts are in series with the starting control circuit of the plant. When these contacts open the start circuit is broken and electric cranking stops. The resistor in series with the coil of this relay narrows the range of speed and voltage within which the electric cranking of the engine is discontinued. The voltage of the standby plant rises to normal and supplies power to the load through the contacts of the contactor.

The coil of the phase protection relay of a 3-phase contactor is permanently connected across one phase of the normal power source. The contacts of this relay remain closed while the normal power source is

energized. The main actuating coil of the contactor is connected in series with the contacts of the auxiliary relay and in series with another phase of the normal power source. With the auxiliary relay coil and the main coil connected across two different phases, an open delta hookup, or power failure on any one or more phases may result in de-energizing the main actuating coil. However, if the connected load is a motor and it is running at the time of failure on one phase of the normal power source, the motor may continue to run single phase and tend to generate enough current to energize the main actuating coil, holding the contactor at in position. If this condition exists and the load on the motor is small, the motor may continue to run until it is shut off or the remaining phase becomes overloaded and blows a fuse. Three phase motors will run single phase but cannot be started on single phase power.

The heating element of the cranking limiter is connected in parallel with the starting control circuit and is energized during the electric cranking period. If, because of lack of fuel or any other reason, the plant does not start within about one minute cranking, the cranking limiter will trip and cranking will stop. When this occurs, the cranking limiter reset button will project out of the limiter case. The cause of failure to start should be located and the trouble corrected. The cranking limiter must then be reset by pushing in on the reset button.

The standby plant continues to carry the load until power is again available from the normal power source. When this occurs, closing of the normally open set of contacts of the Start-Stop relay closes the stopping circuit and the standby plant stops. The GEN-LOAD contacts of the contactor open disconnecting the standby plant from the load. The line energizes the line coil of the contactor closing the line to load contacts. Power is again supplied by the normal power source, through the line contacts of the contactor to the load.

CHECK POSITION

The standby plant may be started for checking purposes by turning the selector switch to the "CHECK" position. This may be done while power is being supplied from the normal power source if desired. The standby plant should be run one 30 minute period each week to assure it's being in good condition to take over the load when the normal power source fails. Power will continue to be supplied by the line during the exercising period unless the main line switch is opened - or unless the line should fail during the exercising period.

Various types of special equipment used with automatic line transfer controls are described in the following paragraphs. The wiring diagram supplied with your line transfer control will indicate such special equipment, where used. PLEASE READ CAREFULLY.

TIME DELAY RELAYS

DELAYED STOPPING. - When used for delayed stopping, the time delay relay allows the standby plant to operate for a pre-selected number of minutes (adjustable) after normal power has been restored. This permits normal power voltage to stabilize before the load is transferred from the standby plant. Two types of delayed stopping relays are available:

1. A.W. HAYDON time delay relay adjustable from 15-90 minutes.
2. AGASTAT time delay relay adjustable from .1 second to 10 minutes.

A.W. HAYDON TIME DELAY ON STOPPING RELAY. - The A.W. Haydon time delay relay consists of a synchronous ac motor which operates a switch with a lever after a predetermined length of time. The actuating lever timing action is controlled by a system of gears. Instantaneous resetting is obtained by the use of a special spring type clutch. The time delay is adjustable from approximately 15-90 minutes.

The A.W. Haydon time delay relay can be adjusted if the necessity arises. Provide a watch to check the timing action.

1. Remove the two screws on the top of the relay cover.
2. Remove the cover of the relay.
3. Remove the four mounting screws holding the relay in place.
4. Located on the rear of the mounting base is a combination locking screw and positioning pin held in place by an offset nut which slides in a semicircular slot. Moving the positioning pin toward the micro switch actuating lever decreases the time delay. The time delay is maximum (approximately 90 minutes) when the positioning pin is in the extreme location from the micro switch and the time delay decreases proportionately as the positioning pin is moved toward the micro switch actuating lever. Loosen the positioning pin with a wrench and slide the nut around the semi-circular slot to the approximate desired position. Check the timing obtained by connecting to 115 volt AC power and timing the operation of the micro-switch against a watch. Two or three settings of the positioning pin may be necessary before obtaining the required time delay.
5. Tighten the positioning pin securely in place.

6. Replace the mounting screws and cover.

AGASTAT TIME DELAY ON STOPPING RELAY. - This pneumatically operated relay obtains its time delay by controlling the amount of air which escapes through an air valve from an inclosed cylinder.

AGASTAT TIME DELAY ON STARTING. - This time delay relay prevents the standby plant from starting for a pre-selected number of minutes (adjustable - .1 second to 10 minutes) after normal power fails. This prevents unnecessary starting of the standby plant upon normal power failures of short duration.

ADJUSTMENT OF AGASTAT TIME DELAY RELAY. - Turn the slotted adjusting screw (A) to the right to increase length of time delay, and to the left to decrease the length of time delay. A very slight adjustment of the screw may result in a wide variation in time delay from the previous setting. A "cut and try" method of adjustment is recommended until desired setting obtained. Normal setting is 30 seconds unless another setting was specified.

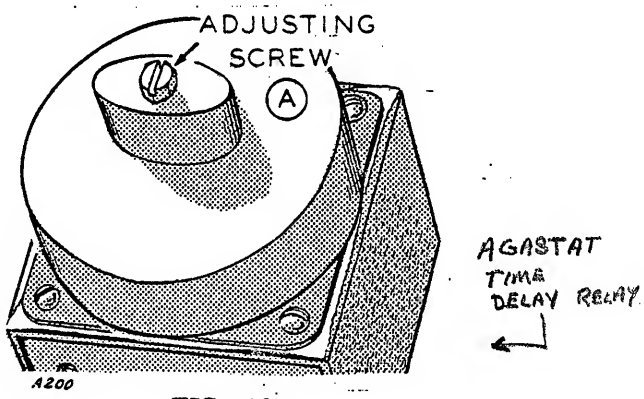


FIG. 16.

VOLTAGE SENSITIVE RELAYS

Voltage sensitive relays affect the transfer of the load to the standby plant when normal power voltage drops to less than a predetermined percentage of normal and re-transfers the load back to the normal power source when normal power voltage increases to about 95% of normal. Damage to electrical equipment resulting from operation on low voltage is thus prevented.

The voltage sensitive relay consists of a Direct Current Relay connected across the output of a half wave selenium rectifier. A 20 MFD. capacitor is connected across the output of the rectifier to maintain current flow during the half cycle that no current flows thru the rectifier. See Wiring Diagram Fig. 17.

THE PICK UP control consists of a wire wound potentiometer which is connected in series with the rectifier and relay coil. The PICK UP control operates by increasing or decreasing the current flowing thru the relay coil. The PICK Up voltage may be adjusted to from 5% to 15% above the DROP-OUT voltage.

THE DROP-OUT control consists of a wire wound potentiometer connected in parallel with the relay coil. The DROP-OUT control operates by increasing or decreasing the amount of current that is by-passed around the relay coil. Increasing the current that is by-passed around the relay coil raises the DROP-OUT voltage. The DROP-OUT voltage is adjustable to DROP-OUT at from 75% to 95% of the applied voltage.

ADJUSTMENTS. - The TYPE "USS" relay can be adjusted if the necessary conditions should arise. Provide a means of reducing the voltage of the normal power source, to simulate a voltage drop. Proceed as follows:

1. Note that there are two adjusting controls. Remove the vinylite caps covering the adjustment controls. See Fig. 18.

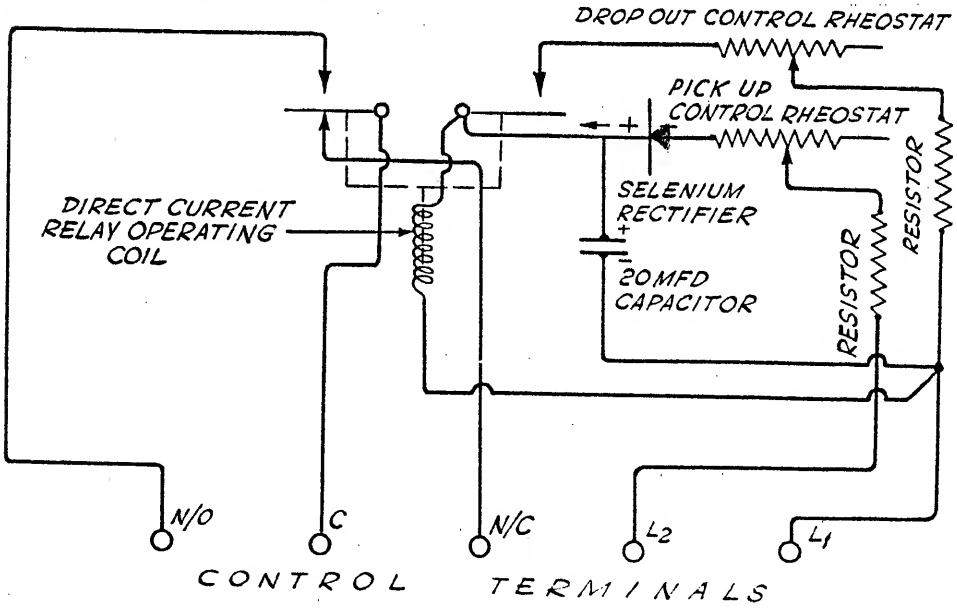


FIG. 17.

VOLTAGE SENSITIVE RELAY

2. Turn the drop out control to its counterclockwise limit.

3. Turn the pick-up control to its clockwise limit.

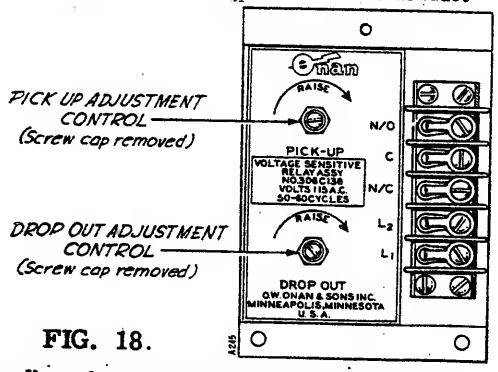


FIG. 18.

4. Have the standby plant supplying power to the load. Adjust the voltage of the normal source of power to the voltage at which the line transfer switch is to transfer from standby power to normal source of power.

5. Turn the pick up adjusting control counterclockwise slowly to the point where the relay contact points close and causes the transfer switch to operate (transfers the load to the normal power source) and stops the standby plant.

6. Readjust the voltage of the normal source of power to the voltage at which the line transfer is to transfer from normal source of power to standby power.

7. Turn the drop out adjusting control clockwise slowly to the point where the relay contact points open and causes the transfer switch to start the standby plant.

8. Repeat the steps 4 and 6 to check the adjustment setting, making any necessary adjustments.

9. Install the vinylite caps over the adjusting controls.

LINE RECOVERY RELAY

Some controls use both a "time delay on stopping" relay and a "time delay on starting" relay. If the control model designation ends with the letter "A", a "line recovery relay" is used. It functions if the line power fails momentarily but is restored before the standby plant can start. It reconnects the load to the line immediately, avoiding the delay which would otherwise take place due to the setting of the "time delay on stopping" relay. On controls with the model designation ending with other than the letter "A", a different circuit is used, and the line recovery relay is not necessary.

EXERCISER

DESCRIPTION. - This device automatically starts the standby plant, allows the plant to run for a selected length of time without taking over the electrical load, and then stops the standby plant. Settings can be made for as many exercise periods per week as wanted. A single exercise period of 1/2 hour is preferred over several periods of short duration. Its purpose is to assure instant starting during emergencies, through exercise periods which keep the fuel system filled with fuel and the starting batteries charged.

ADJUSTMENT. - The clock is equipped with a 24 hour dial with 15 minute settings between each operation. The light half of the dial is for the 12 daytime hours and the dark half for the 12 night time hours. A synchronous self-starting motor operates the clock. After a current interruption, the time switch must be reset to the correct time of day. To set the time switch to the correct time of the day loosen the LEFT HAND THREAD dial lock nut and turn the dial by hand, in a clockwise direction only, until the pointer marked "TIME" is opposite the correct time of day. After setting the dial to the correct time, tighten the dial lock nut securely by turning the dial nut in the "TO TIGHTEN" direction. Eight "trip pins" for four operations daily are supplied with the clock. A trip pin placed in the inner row of holes on the dial must be matched with a trip pin in the outer row of holes on the dial to complete one operation for the selected time interval.

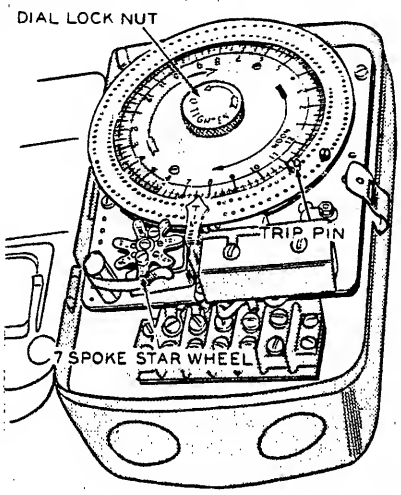


FIG. 19.

The trip pins have LEFT HAND THREADS and must be set into the dial securely with a small screw driver. Intervals between the operations may be as short as 15 minutes or as long as desired in a 24 hour period. The holes in the dial are in stops of 15 minutes. Set one pin in the inside row of holes at the time the first exercise period is to start. Set one pin in the outside row of holes at the time the first exercise period is to stop. Place pins accordingly for each additional exercise period wanted during the 24 hour period. One exercise period requires the use of only one pair of pins.

The small seven spoke star wheel controls the days on which the exerciser operates. Each spoke is marked for one day of the week. Install a pin in each spoke FOR WHICH NO EXERCISE PERIOD IS DESIRED. Turn the start wheel (counterclockwise) until the correct day-spoke is aligned with the small day pointer. The wheel will automatically turn 1 spoke each day, causing the exerciser to operate on those days for which no pin is installed.

WARNING SIGNAL LIGHT

When the normal source of power fails and the standby plant cranks but fails to start, the cranking limiter switch interrupts the cranking circuit and a warning signal light operates. The warning signal light indicates that the power failed, and that the plant failed to start. On controls using the Kurman signal relay (Onan No. 307-197) the signal light goes out when normal power is restored, even if the cranking limiter switch is not reset. On controls using the Guardian relay (Onan No. 397-54) a special holding contact on the relay permits the signal light to stay on after normal power is restored. Resetting the cranking limiter turns the signal light off. Always determine the reason for starting failure before resetting the cranking limiter.

WARNING ALARM SIGNAL

When a howler, horn or similar warning device is used to indicate failure of the standby plant to start, a heavy contact type relay is used, which is actuated by a relay of the same type as used for the signal light. A disconnect switch is used to silence the alarm before resetting the cranking limiter. Be sure to close the disconnect switch after resetting the cranking limiter.

BATTERY CHARGER

The battery charger accessory operates on 115 volt, 50 or 60 cycle, AC lines, and is used in addition to the trickle charging circuit built into the line transfer control. Its purpose is to provide a quick means of recharging the starting batteries without operating the standby plant. The high rate charger should be disconnected as soon as the starting batteries are fully recharged.

WHAT TO DO IN CASE OF TROUBLE

When installed and used properly, your automatic line transfer control requires little attention. In case of failure of the standby plant to start or stop automatically, do not hastily conclude that the line transfer is at fault. Determine the exact cause of the trouble before attempting to make adjustments or repairs. Make the following checks in the order given.

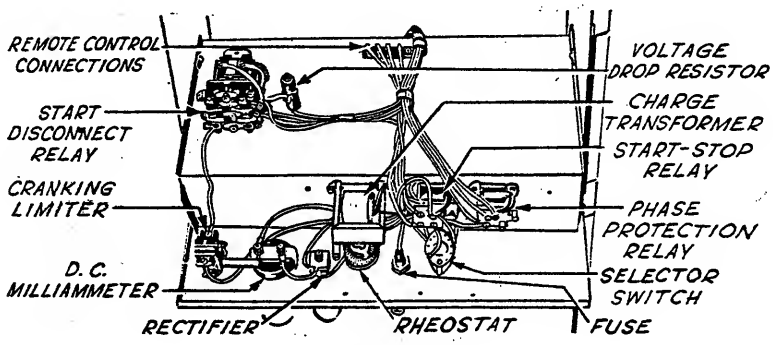


FIG. 20.

1. See that all connections are electrically secure.
2. See that the selector switch is at AUTO position.
3. Where used, see that the manual-remote toggle switch on the standby plant control panel is at ELECT. START position.
4. Press the cranking limiter reset button inward to make sure the contacts are closed.
5. Check the specific gravity of the battery to assure that it is in a well charged condition. The specific gravity of a fully charged battery is about 1.280 (1.210 for tropical climates). See that the fuse in the battery charging circuit of the line transfer control is in good condition and that all battery connections are clean and tight. If the starting battery fails to stay charged, check the entire battery charging circuit of the line transfer control.
6. If power is being supplied by the normal power source and is not reaching the connected load check the line-load contacts of the contactor and the load circuit for the cause. The trouble probably is in the load circuit and may be a broken wire, loose connections, blown fuse outside the line transfer control box, a defective switch, defective lamp or appliance, a ground on both sides of the load circuit or an improper ac load. Repair or replace as needed.

Avoid bending any part of the relay. If the contact points of the contactor are badly burned or pitted, replace them. DO NOT TOUCH THE LINE TRANSFER SWITCH WITHOUT FIRST THROWING THE

NORMAL POWER SOURCE MAIN SWITCH TO "OFF" POSITION AND TURNING THE SELECTOR SWITCH OF THE LINE TRANSFER TO STOP POSITION.

7. If the normal power source is out because of failure and power is being supplied by the standby plant but is not reaching the connected load, check the contacts of the contactor and the load circuit for the cause. To find and correct the trouble, follow the instructions given in paragraph 6.

8. If the standby plant will not start upon failure of the normal power source when everything seems to be in good order and the selector switch is at AUTO position, turn the selector switch to CHECK position. If the standby plant starts at this position, the trouble is probably in the selector switch or in the contact points of the AUTO control circuit. These contact points are located on the start-stop relay. The same is true if the standby plant will start at AUTO position but not at the CHECK position.

9. If the standby plant does not start automatically at either the AUTO or CHECK position, try starting the standby plant by pushing the START button on the standby plant control panel. If the plant starts OK, the trouble probably is in the control circuit.

10. If the standby plant will not start by pushing the START button on the plant control panel, try starting by hand cranking. Turn the Selector switch of the line transfer control to the HAND CRANK position and the manual-remote switch (plants with battery ignition) of the standby plant to HAND CRANK position. Then crank the plant. If the plant starts by hand cranking but will not start at any other position of the selector switch, check first for a discharged battery. Then check all control circuits for loose connections broken wires or defective parts. Repair or replace as needed. NOTE: THE STANDBY PLANT MANUAL-REMOTE SWITCH MUST BE RETURNED TO ELEC. START POSITION AS SOON AS THE PLANT STARTS.

11. If the standby plant cannot be started by any of the preceding methods, check the fuel and ignition systems of the standby plant. Correct any trouble found.

12. If the standby plant has been supplying power due to failure of the normal power source, and the plant fails to stop automatically when the normal power source is again supplying the power, check the STOP control circuit. Also see that the standby plant manual-remote switch (plants with battery ignition) is at ELEC. START position.

13. After determining by the foregoing tests that everything else is in good order, and if the trouble still exists, the automatic line transfer control should be carefully checked for certain conditions which you may be able to correct.

14. Pull the main fuse or switch of the normal power source and turn the selector switch of the line transfer control to the STOP position. For added protection disconnect one battery cable from the battery. Check the control for loose connections and broken wires. Correct any found. Any dust that may have settled in the control box should be blown out.

If careful analysis shows that the automatic transfer control requires repairs other than noted, it is recommended that you return the control to the dealer for repairs.

NOTE

The standby plant may be operated manually or as a remote start plant while the automatic line transfer control is not in service. It will be necessary to connect the load wires (CAUTION: NOT LINE WIRES!) directly to the AC OUTPUT terminals at the plant. If a grounded load wire is used, be sure that it is connected to the grounded AC OUTPUT plant terminal. Disconnect also the remote control circuit wires B—, 1, 2, and 3 from the plant remote control terminals.

MAINTENANCE AND ADJUSTMENT OF THE CONTACTOR

CAUTION

DO NOT TOUCH THE LINE TRANSFER SWITCH WITHOUT FIRST THROWING THE NORMAL POWER SOURCE MAIN SWITCH TO "OFF" POSITION AND TURNING THE SELECTOR SWITCH OF THE LINE TRANSFER CONTROL TO THE STOP POSITION.

CONTACTS

1. Contacts do not require cleaning or refacing for the life of the equipment. Discolored silver contacts operate efficiently. Do not file contacts.

2. Continuous loads should not exceed the rating given on the line transfer control nameplate.

3. The contactor has been properly adjusted for its service at the factory.

4. If the contact points of the contactor are badly burned or pitted, replace them.

5. To replace contacts proceed as follows:
   (a) Remove the Alkyd plastic hood.
   (b) Remove washer and spring.

(c) Contact may then be removed from guide post. When replacing contacts, be sure that the curved silver contact surfaces are facing inward.

COIL REPLACEMENT

1. To remove the contactor coil proceed as follows:
   (a) Disconnect coil lead wires.
   (b) Snap off retaining fasteners and slide out cross bar under stationary armature.
   (c) Slid out stationary armature and coil.
   (d) Remove cotter pin.
   (e) Remove coil retaining slides.
   (f) Lift out coil.

2. Coils are rated according to voltage. Any coil used at the rated voltage which is stamped on the coil, will last indefinitely. If the coil becomes burned out frequently, it is probably caused by either too much or too litttle voltage. If such a condition exists, check your voltage and be certain that it is correct for the coil that you are using.

HUM

Alternating current hum has been minimized by the provision of shading coils and by grinding the sealing faces of the magnet assembly. Dirt or dust between these surfaces will cause noise. Clean these surfaces by lightly rubbing with a medium fine grade of emery cloth. Remove all traces of emery dust.

FOR SERVICE OR PARTS, CONTACT THE DEALER FROM WHOM YOU PURCHASED THIS EQUIPMENT OR REFER TO THE COMPANY LISTED ON THE NAMEPLATE OF YOUR CONTROL.

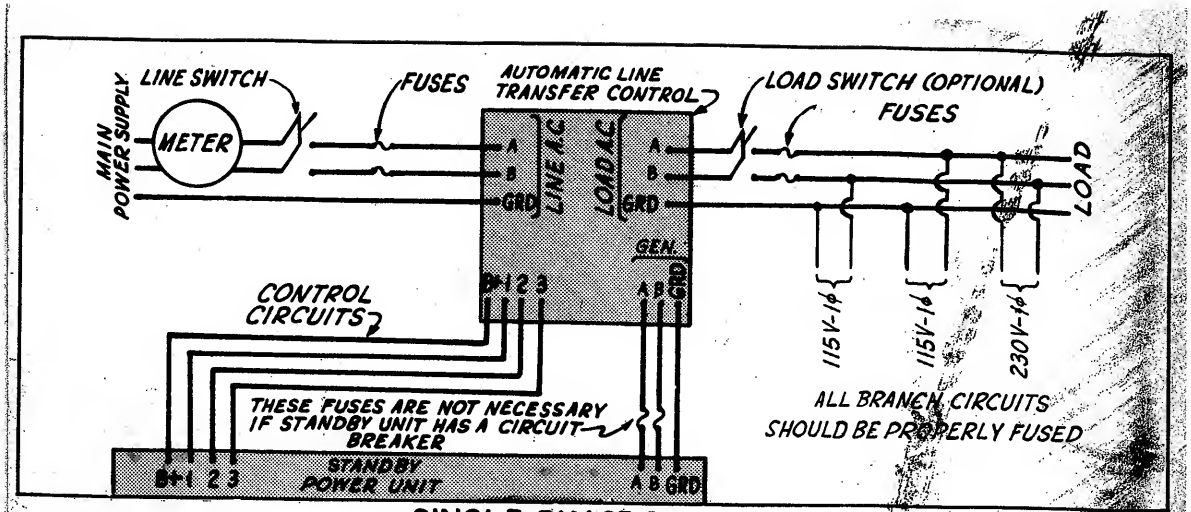
Obtain part numbers and description of all repair parts from the Wiring Diagram furnished with the control.

Be sure to state on your order the Model and the Serial No. of the control for which parts are required. Obtain these numbers directly from the identification plate.

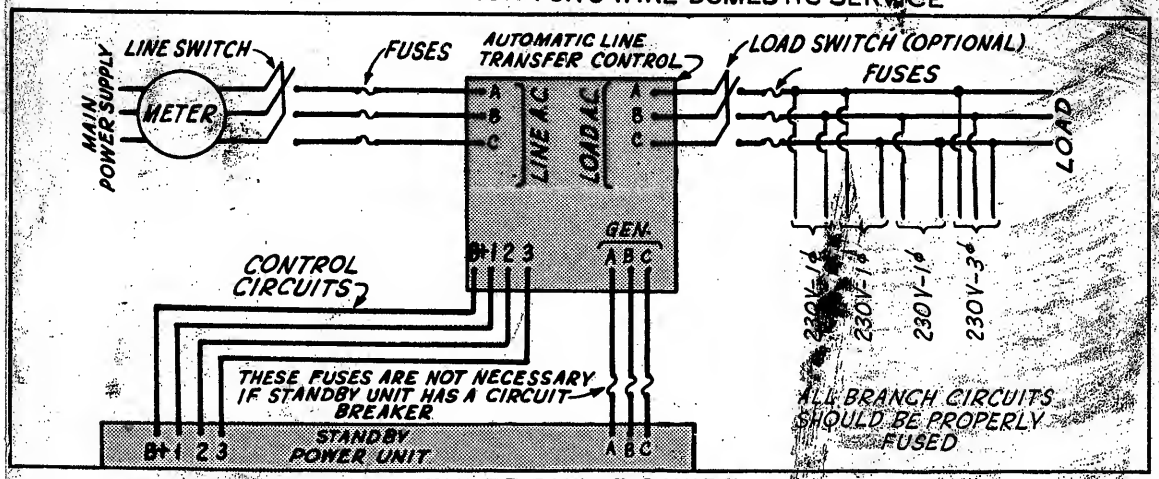
Order parts by part numbers and complete description as listed in the diagram. State the quantity of each part desired. If unable to identify the part required, return the old part to the address shown on the transfer control nameplate. Print your name and address plainly on the package. Regardless of any previous correspondence, write a letter to the same address describing the part and stating the reason for returning it.

Please do not order parts in a letter in which some other subject is treated. State definite shipping instructions when ordering parts.

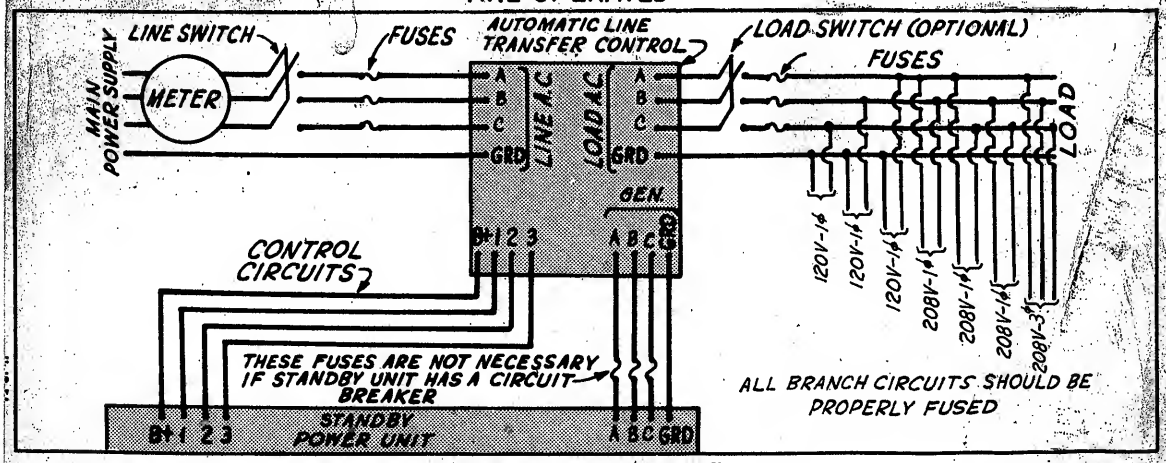
All shipments are complete unless the packing list indicates items are back-ordered. Shipments are properly packed and in good order when delivered to the transportation company. Any claim for loss or damage in transit should be filed promptly against the transportation company making the delivery.



SINGLE PHASE, 3 WIRE
TYPICAL INSTALLATION FOR 3 WIRE DOMESTIC SERVICE



THREE PHASE, 3 WIRE
TYPICAL INSTALLATION FOR INDUSTRIAL USE WHERE 3 PHASE MOTORS ARE OPERATED

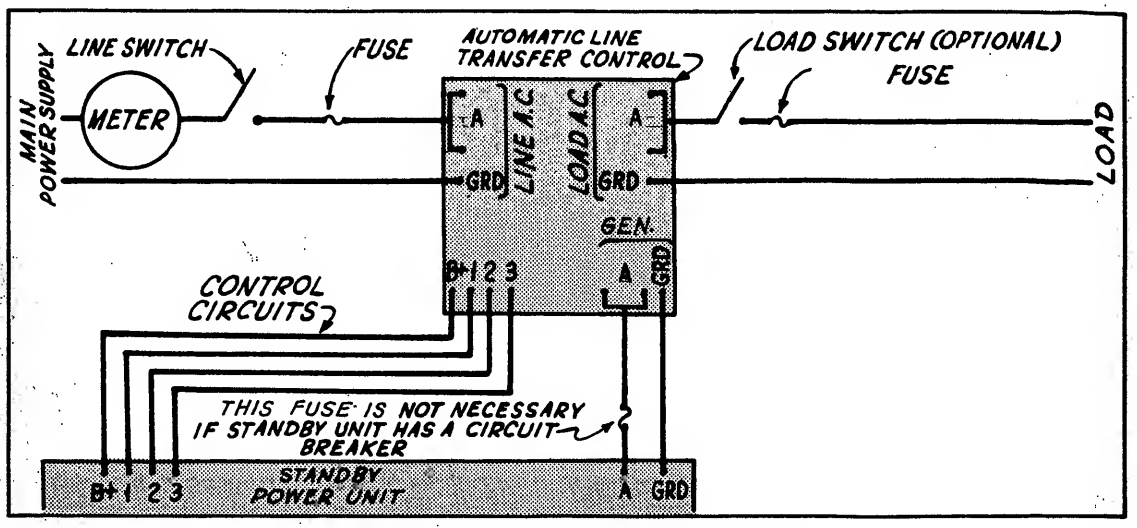


THREE PHASE, 4 WIRE
TYPICAL INSTALLATION FOR INDUSTRIAL USE WHERE 3 PHASE-DUAL VOLTAGE IS REQUIRED

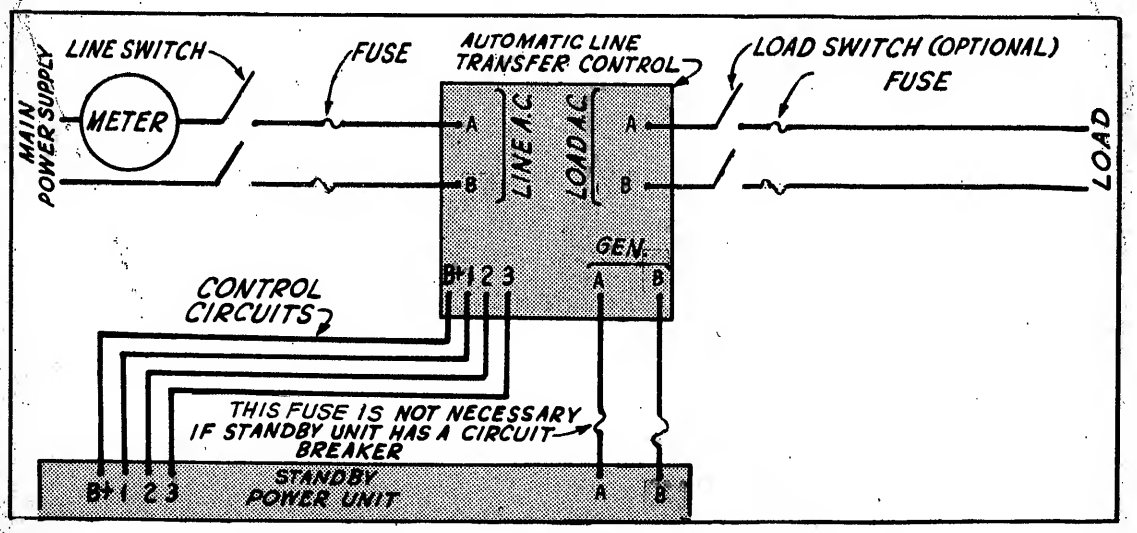
D. W. ONAN & SONS INC. MINNEAPOLIS, MINN.

SCHEMATIC WIRING DIAGRAM OF TYPICAL INSTALLATIONS FOR "LT" TYPE LINE TRANSFER CONTROLS.

All LINE leads, LOAD leads, GENERATOR leads, and CONTROL leads must be properly connected as shown by the installing electrician. For more detailed information see the Wiring Diagram and the Instruction Manual furnished with the control.



115 VOLT, SINGLE PHASE, 2 WIRE
TYPICAL INSTALLATION FOR 2 WIRE DOMESTIC SERVICE



230 VOLT, SINGLE PHASE, 2 WIRE
TYPICAL INSTALLATION FOR 2 WIRE DOMESTIC SERVICE

OVER

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